MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

ECE3076 – DATABASE SYSTEMS

(All Section / Groups)

15 MARCH 2018
9.00 A.M. – 11.00 A.M
(2 Hours)

INSTRUCTION TO STUDENTS

1. This examination paper consists of five (5) printed pages including cover page containing four (4) questions only.

2. Answer all questions. All questions carry equal marks (25 marks each) and the distribution of marks for each sub-question is given. The total for this paper is 100 marks.

3. Please write all your answers in the Answer Booklet provided.

Question 1

You are given a database system for a room management database system for Professional Training Sdn Bhd. The following relational schema is provided. Primary keys for each table are in **bold** and underlined.

```
Class   (Class_ID, Class_Size, Class_Date, Start_Time,
         End_Time, Room_No, Staff_ID)
Room    (Room_No, Building, Room_Type, Availability)
Instructor(Staff_ID, Staff_Name, Position)
```

Notes:

- `Class_ID` and `Staff_ID` are auto-incrementing `INT(10)`.
- `Room_No` is a `CHAR(3)`.
- `Building`, `Room_Type`, `Staff_Name`, and `Position` are `VARCHAR(255)`.
- `Class_Size` is `INT(3)` while `Availability` is `INT(1)`.
- `Start_Time` and `End_Time` is type `Time`. `Class_Date` is type `Date`.

a) Write an SQL command to create the table `Class` with proper foreign key references. Set deletions from the `Room` and `Instructor` tables to null.

[7 marks]

b) Write an SQL command to add the `Decimal(8,2)` field `Salary` into the `Instructor` table.

[2 marks]

c) Write an SQL command to update all instructors with the position of `Senior Trainer` to a starting salary of RM9000.

[2 marks]

d) Write an SQL command to load data from `'c:\room.txt'` into the table `room`.

[3 mark]

e) Write an SQL to create a view called `Dec18_Usage` that displays the room usage for December 2018. The view should have two columns, `Room_No` and `Use_Count` where `Use_Count` counts the number of classes for December 2018.

[5 marks]

f) Create a trigger `unassign_room` such that upon the update of a room's availability field that sets it to 0, all the corresponding `Room_No` field of the `Class` table will be set to the value `NULL`.
[Hint: use an `If-Then` control in the body of the trigger. Also change the delimiter to `//` so that the `;` delimiter can be used for the `If-Then` control structure.]

[6 marks]

Continued...

Question 2

You are tasked to design a database for a photobook company. The following are their business rules:

- A customer uploads many photos to be used for their photobook, and must have at least one photo uploaded per page. A photobook consists minimally of 10 pages.
- Each page can have multiple photos uploaded by the customer, but must have at least one.
- A page requires a layout. A layout template can be applied to many pages for multiple albums. However, unpopular ones are not used at all.
- A page can have many captions or none at all. A caption is specific to a page. The page layout template with the maximum amount of caption slots is 8.
- A photobook consists of a minimum of 10 pages, and a maximum of 25. Each page designed with particular photos and captions from the customer, belongs specifically to an album.
- A customer can have multiple albums, but must have at least one to be recorded in the system. An album belongs solely to a particular customer.

a) Using either Chen's OR Crow's foot notation, draw an ER diagram to represent the conceptual model for the database based on the rules above. You must indicate all possible connectivity and cardinality information in your diagram.

[24 marks]

b) If the company wishes to segregate the customers' dataset into new and returning customers, would these two subsets be disjoint or overlapping?

[1 mark]

Continued...

Question 3

a) What is the purpose for normalization?

[1 mark]

b) Given the dependency diagram Figure 3(b) below, answer the following questions:

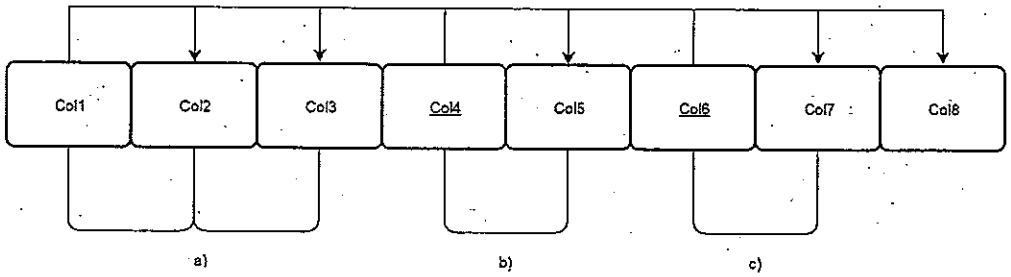


Figure 3(b)

i) From the diagram, what are the primary key attributes?

[2 marks]

ii) Label the dependencies a), b) and c).

[6 marks]

iii) Explain why attribute Col8 does not have a dependency arrow.

[2 mark]

iv) What is the requirement for normalization to the third normal form (3NF)?

[2 mark]

v) Show the relations after normalizing the table to third normal form (3NF).
[Hint: You may use numbers for relation names. You do not need to show 2NF.]

[4 marks]

c) How does a relation satisfy referential integrity?

[2 marks]

d) Given a schema for two entities below, represent it with two tables with FOUR sample records each in a way that fulfills the entity integrity and referential integrity requirements.

`Album(Album_ID,Album_Name, Artist)`
`Song(Track_ID, Song_Title, Album_ID, Track_Order)`

Note that `Album_ID` from `Song` is the foreign key relating the `Song` entity to the `Album` entity.

[6 marks]

Continued...

Question 4

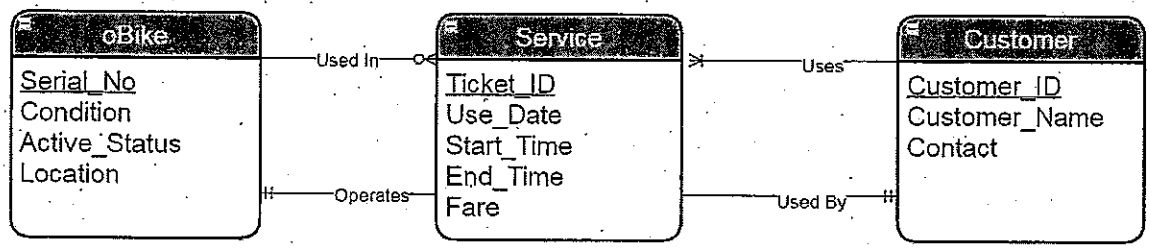
a) The following table depicts a scenario with several transactions from different users and the data items locked and required by each transaction.

Transaction	Data Items Locked	Data Items Required
T1	X11,X14	X7
T2	X2,X5,X6	X1,X7,X8,X9
T3	X4,X12,X16	X7
T4	X1,X8,X9	X7
T5	X7	X3,X15
T6	X3,X15	X4,X12,X16
T7	X10,X13	X4,X7,X12,X16
T8	X17,X18	X7

Draw a wait-for graph. Indicate the transactions that are causing the deadlock if any.

[5 marks]

b) Convert the following Crow's Foot ERD into its object oriented UML equivalent representation.



[15 marks]

c) Answer the following questions on database recovery management:

i) Give TWO examples of database failures.

ii) State and briefly explain the THREE different levels of database backup.

[5 marks]

End of paper